

Claims

1. Sample processing station, which is comprised of the following:
 - a device base plate (1);
 - a shaking table plate (3) vertically supported (2) against said device base plate and movable in a horizontal plane;
 - a shaking drive (4) arranged between and connected to the two said plates for the horizontal movement of the shaking table plate, said movement essentially and exclusively being one of translation, with the means by which to arrest the shaking table plate into a precise resting position;
 - a microtiter plate holding fixture (5) provided on the shaking table plate (3);
 - and
 - a removable microtiter plate (6) inserted in the holding fixture, said plate exhibiting a multitude of sample wells (7), which can be filled with samples or whose samples can be emptied out by an automatically activated filling or removing device;thus characterized, that over the microtiter plate (6) is a removably arranged evacuating plate unit (8) spanning over the latter, which is formed to be hermetically sealed in such a manner that a vacuum is permitted to be generated in all of the sample wells of the microtiter plate (6) and which is controllably connectable to a vacuum source or to a directed airflow source via ports (14, 17) in the device base plate (1).
2. Sample processing station in accordance with claim 1, thus characterized in that heat can be conducted to the bottom ends of the sample wells (7) originating from an electrical surface heating device (24) provided on the shaking table plate (3), said electrical surface

heating device being connected via flexible lines (36) to a power supply terminal (37) in the device base plate (1).

3. Sample processing station in accordance with claim 2, thus characterized in that the surface heating device on the shaking table plate (3) exhibits a metal heat distribution plate (25), arranged over a surface heating element, from which heat transfer knobs (26) formed as one piece protrude, said knobs each respectively being assigned to a corresponding sample well (7).
4. Sample processing station in accordance with claim 3, thus characterized in that located between the heat transfer knobs (26) and the sample well bottom ends is a continuous, pliable heat transfer layer (27), more specifically in the form of a heat conducting foamed plastic mat.
5. Sample processing station in accordance with claim 4, thus characterized in that the space over the heat distribution plate (25) and under the heat transfer layer (27) around the heat transfer knobs (26) along the lateral edges of the shaking table plate is hermetically sealed and via a lead-through channel configuration (28, 29) penetrating through the heat distribution plate (25), the surface heating element (24) and the shaking table plate (3) as well as via flexible line segments (30, 31) in the direction to the device base plate (1), is controllably connected to a cooling medium circuit.
6. Sample processing station in accordance with one of the claims 1 through 5, thus

characterized in that the microtiter plate (6) exhibits a through-going sample container connecting plate at the level of the base container bottom ends and/or at the level of the sample container flow openings, that the space around the individual sample containers (7) above or below the sample container connecting plate as well as along the lateral edges of the microtiter plate is hermetically sealed off and is controllably connectable to a heating medium circuit and/or to a cooling medium circuit by means of a lead-through channel configuration (47, 48) extending up to the underside of the shaking table plate as well as via flexible lines (49, 50) in the direction to the device base plate (1).

7. Sample processing station in accordance with one of the claims 1 through 6, thus characterized in that over the sample well connecting plate or over a sample container connecting plate connecting the sample containers (7) at the level of their flow openings is located a channel opening plate (53) securely connected to the microtiter plate (6), from which channel opening plate channel connections (55), specifically provided with lower slosh baffle rings (56), extend as one piece to the individual sample container openings and that the space over the sample container connecting plate and below the channel opening plate around the individual channel connections (55) along the lateral edges of the microtiter plate is hermetically sealed off and is controllably connectable to a cooling medium circuit (62) by means of a lead-through channel configuration (58, 59) extending through the microtiter plate (6) and finally up to beneath the shaking table plate (3) and via flexible line segments (60, 61) in the direction to the device base plate (1).
8. Sample processing station in accordance with one of the claims 1 through 7, thus

characterized in that over the evacuating plate unit (8) is provided a blast nozzle plate unit (39, 40) with a number of blast nozzles (41) corresponding to the number of sample wells (7) of the microtiter plate (6), of which the blast channels, each respectively oriented toward the corresponding sample well opening, penetrate through a wall of the evacuating plate unit turned toward the microtiter plate and are all connected to a blast medium supply chamber (39) or to a blast medium supply channel system, said blast medium supply chamber or channel system being connected to a blast gas source.

9. Sample processing station in accordance with one of the claims 1 through 8, thus characterized in that the evacuating plate unit (8) exhibits lateral walls (10) whose lower edge releasably provides a hermetic seal (11) against the device base plate (1) that is formed to be gas tight for the surroundings.
10. Sample processing station in accordance with claim 8 or 9, thus characterized in that the drive amplitude of the shaking drive (4) is selected in such a manner that the flowing gas blasts, exhibiting unchanged positioning opposite the device base plate (1), discharged from the individual nozzle channels (41) always exclusively hit on the flow opening of the corresponding sample well.
11. Sample processing station in accordance with one of the claims 1 through 8, thus characterized in that the evacuating plate unit (8) exhibits lateral walls (10) whose lower edge around the lateral edge of the microtiter plate provides a releasably hermetic seal against the shaking table plate (3) that is formed to be gas tight for the surroundings and

that the inner space in the evacuating plate unit is controllably connectable to the vacuum source or to the directed airflow source by means of a lead-through channel configuration penetrating the shaking table plate (3) and via flexible line segments (20, 21) to the device base plate (1).

12. Sample processing station in accordance with one of the claims 1 through 8, thus characterized in that the evacuating plate unit (8) exhibits lateral walls (10) whose lower edge releasably seals off against a sealing edge of the microtiter plate (6) surrounding all of the sample container flow openings, and that the inner space in the evacuating plate unit is controllably connectable to the vacuum source or to the directed airflow source by means of a lead-through channel configuration (12, 13, 15, 16) penetrating the microtiter plate (6) and the shaking table plate (3) and via flexible line segments to the device base plate (1).
13. Sample processing station in accordance with claim 11 or 12, thus characterized in that on the upper face of the microtiter plate (6) or on the upper face of a channel opening plate (53) set thereupon, support knobs (63) protrude which are located between the sample container flow openings and against which the downward extending wall surface of the cover wall of the evacuating plate unit is supported during action of the vacuum upon the inner space thereof.
14. Sample processing station in accordance with claim 9 or 10, thus characterized in that on the underside of the evacuating plate unit (8) is provided a matrix configuration

comprised of mixing pins that are securely connected or securely connectable to said evacuating plate unit underside, whereby the matrix configuration is set or is adjustable at such a level on the evacuating plate unit that, when the evacuating plate unit is under vacuum and is hermetically sealed off against the device base, the individual mixing pins each respectively assigned to one sample well of the microtiter plate extend with their bottom tips into the corresponding sample wells without touching the bottom thereof, wherein the position of the mixing pins in the matrix configuration and the drive amplitude of the shaking drive are set in such a manner that, during operation and during repose, the mixing pins do not come in contact with the inside walls of the sample wells.

15. Sample processing station in accordance with one of the claims 11 through 13, thus characterized in that the microtiter plate (6), which exhibits indexing means, is provided with an insertable or removable mixing pin plate (64) with vacuum holes and grasping openings, which bears a matrix configuration of downward extending mixing pins or mixing ladles with respectively one assigned to each sample well (7), said mixing pins or mixing ladles extending with their bottom tips into the corresponding sample wells (7) without touching the bottom thereof, whereby the mixing pin plate (64) together with the indexing means of the microtiter plate exhibits counter indexing means interacting with horizontal clearance of motion and the position of the mixing pins in the matrix configuration and the horizontal clearance of motion are selected in such a manner that during operation and during repose of the shaking drive (4), the mixing pins do not come in contact with the inside walls of the sample wells, and whereby the inert mass of the mixing pin plate and its frictional relation to the microtiter plate are adjusted in such a

manner that during operation of the shaking drive, the mixing pin plate carries out relative movements within the mentioned horizontal clearance of motion opposite the microtiter plate.

16. Sample processing station in accordance with claim 15, thus characterized in that the mixing pin plate (64) exhibits a matrix configuration comprised of perforations oriented toward the sample container openings of the microtiter plate from whose boundaries the mixing pins or the mixing blades each respectively project downward, and which serve to fill or empty the sample containers without removal of the mixing pin plate from the microtiter plate.
17. Sample processing station in accordance with one of the claims 1 through 16, in which the microtiter plate exhibits a sample container connecting plate at the level of the sample container bottom ends and/or at the level of the sample container flow openings, thus characterized in that in the region between each respective group of four sample container bottom ends or of four sample container flow openings, permanent magnet base through-going openings are provided and that a permanent magnet base matrix configuration is arranged either under the microtiter plate or over the microtiter plate whose permanent magnet bases are either insertable from below in the upward direction or from above in the downward direction into the permanent magnet through-going openings into the spaces between the sample container groups of four.
18. Sample processing station in accordance with claim 17, thus characterized in that the

permanent magnet bases (67) project outward from a permanent magnet base connecting plate (66) which is arranged beneath or above the microtiter plate to be removable from the latter.

19. Sample processing station in accordance with one of the claims 1 through 18, thus characterized in that relative to the device base plate (1) and to the shaking table plate (3) supported thereupon, the microtiter plate (6), a permanent magnet base plate, which is possibly arranged either under or above said microtiter plate, a mixing pin plate (64), which is possibly arranged over the microtiter plate (6), the evacuating plate unit (8) spanning over the microtiter plate (6) exhibit robotic manipulator grasping elements for interaction with the manipulator of a single robot and based on the desired selection, are stackable or separable from one another.